Home Made Air Conditioning Unit

Sk.H.Sharief
Associate Professor
Department Of Mechanical , Avanthi Institute Of Engineering And Technology , Tagarapuvalasa

Tadala Akhil
Assistant Professor
Department Of Mechanical , Avanthi Institute Of Engineering And Technology , Tagarapuvalasa

Abdul Khurshid
Assistant Professor
Department Of Mechanical , Avanthi Institute Of Engineering And Technology , Tagarapuvalasa

Abstract : The objective of this project is to increase the effectiveness of the ordinary table fan by using simple mechanism. It is Easy to choose a size of HOME MADE AIR CONDITIONING UNIT according to the room size. A General room temperature will be 34oc. If the room size is 14*7 feet then a unit of 3000rpm fan speed will be used. If the room size is 10*8 feet then a unit of 2500 rpm fan speed is used. If the entering air is dry enough, the results can be quite cooling.

I. INTRODUCTION

World is always trying to invent new one. Somebody tries to find new one and tries to modify an ordinary one to implement a technology. Energy plays an important role in the material, social and cultural life of mankind. This is the result of population growth and increase in the standard of living which is directly proportional to energy consumption. In summer, air conditioners and heat pumps work the same way to provide cooling and dehumidification. Air conditioning systems have become an integral part of many modern buildings. They extract heat from inside the home and transfer it outside. Both systems typically use a vapour compression cycle. This cycle circulates a refrigerant, a material that increases in temperature significantly when compressed and cools rapidly when expanded. The exterior portion of a typical air conditioner is called the condensing unit and houses the compressor, the noisy part that uses most of the energy, and the condensing coil. An air-cooled condensing unit should be kept free from plants and debris that might block the flow of air through the coil or damage the thin fins of the coil. Ideally, the condensing unit should be located in the shade. However, do not block air flow to this unit with dense vegetation, fencing or overhead decking. The inside mechanical equipment, called the air-handling unit, houses the evaporator coil, the indoor blower, and the expansion, or throttling valve. The controls and ductwork for circulating cooled air to the house complete the system.

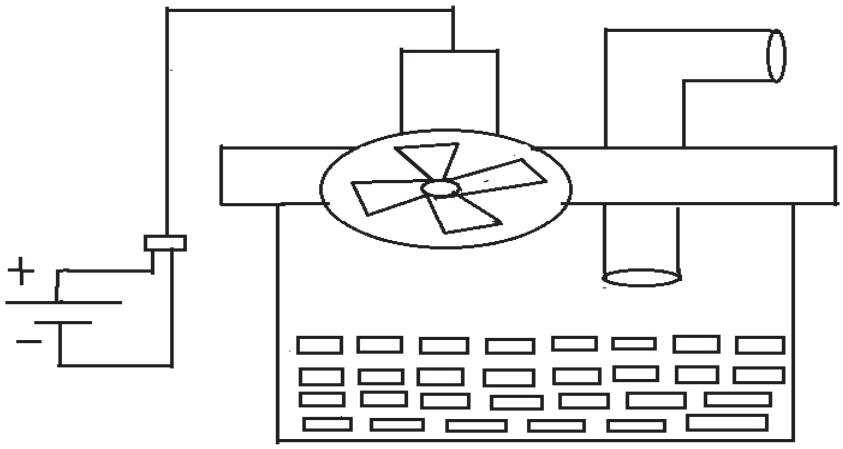


Fig19. Working of Home Made Ac

For a air conditioning unit to operate with Economy, for this reasons all air conditioners use the same cycle of compression , condensation, expansion and evaporation. To keep cooling efficiently, the air conditioner has to goes back to liquid again. The heat created by the Gas inside the room is then evacuated to the outdoors with the help of Fan, therefore, it changes back to liquid and the process starts again.
To keep cooling efficiently in Home Made Air conditioning unit the refrigerant (Ice Or Water) should be more and heat inside the room is cooled by using fan which is of high speed.

II. FABRICATION WORK

The components are arranged according to the schematic diagram. The cooling system contain refrigerant like water or glycol whose temperature decreases as time passes.

1. First of fall take a cooler type box which is made of thermocol sheet.
2. Place the Ice cubes inside the thermocol box of various loads 2000gm, 1500gm, 1000gm, 500gm respectively.
3. Insert a PVC pipe and Fan on the top of Thermocol box with required dimensions and connect to the circuit.
4. while inserting Fan and Pipe in Thermocol box make sure that thermocol box should not be with holes so that air will pass through the holes.
5. Fit the Fan and pipe in Thermocol box Hole which is made with required dimension.
6. Now Switch on the circuit so that cool breezes will come from the PVC pipe.
7. Note down the readings of temperature in digital thermometer.
8. Repeat the experiment with various loads inside room.

III. LOAD CALCULATIONS

The capacity of the air conditioning unit should be sufficient to maintain the desired conditions in a room or conditioning space when operating on full load.
COOLING LOAD:
The quantity of heat removed from the room by the system is called cooling load. It is estimated on the basis of Heat gained of the room.

IV. FORMULAS

- Relative Humidity(RH) = p/ps
- Enthalpy(h)= 1.005td+W[2500+1.9tdp]
- Specific Humidity(Ws)= 0.622Pv /Pb-Pv

- Degree of Saturation(μ)= w/ws

TEST OBSERVATIONS: From Manufacturing equipment data,
Room Temperature (DBT) = 33OC
Thermocol Box Inside Temperature after putting ice = 17oc
Number of persons = 2
Total area of the room = (14 by 7) feet

LOAD (gm)	**TIME CONSUMED**	**DBT (^OC)**	**WBT (^OC)**	**Relative Humidity**	**Enthalpy (kj/kg)**
2000 Gm	60 min	33^OC	27.2^oc	65%	79.89

V. CALCULATIONS

Load=2000gms of Ice
DBT=33oC
WBT=27.2Oc
From psychometric chart,
1. Relative humidity=65%

ø=65%

2. Specific humidity:
W=0.622Pv/Pb-Pv
Where Pv= partial pressure

$$Pv = Pw - \frac{(Pb-Pw)(td-tw)}{1544-1.44tw}$$

Where Pw=saturation pressure corresponding to WBT
Pb=barometric pressure
td=DBT
tw=WBT
At WBT=27.2oc, Pw=0.03564 bar
Therefore,
Pb=740mm of Hg
=740×133.3

Since, 1mm of Hg=133.3 N/m2

=98642 N/m2
Pb=0.98642 bar
Now,

$$Pv = (0.03564) - \frac{[(0.98642-0.03564)(33-27.2)]}{[1544-1.44(27.2)]}$$

Pv= 0.03198 bar
Now,
Specific humidity W= 0.622Pv/Pb-Pv

$$W = \frac{0.622 \times 0.03198}{0.9864-0.03198}$$

W= 0.02084 Kg/kg of dry air.

W= 20.4 G/kg of dry air

3. Dew Point Temperature:

Since the dew point temperature is the saturation temperature corresponding to the partial pressure of Pv. Therefore from steam tables,
We find that corresponding to a pressure of 0.03198 bar. The Dew point temperature is,

$t_{dp}= 25^oc$

4. Degree of saturation:

$\mu = W/Ws$

where, Ws= specific humidity of saturated air

Now, $Ws = \frac{0.622Ps}{Pb-Ps}$

Ps = saturation pressure corresponding to DBT

At 33oc of DBT, Ps= 0.05029 bar

$Ws = \frac{0.622 \times 0.05029}{0.9864-0.05029}$

Ws= 0.0334 kg/kg of dry air

Therefore,

$\mu = W/Ws$

$\mu = \frac{0.02084}{0.03341}$

$\mu = 62.375\%$

5.Enthalpy:

$h= 1.022td+W[hfgdp+2.3tdp]$

where,

hfgdp= latent heat of vapourisation of water at tdp 25oc.

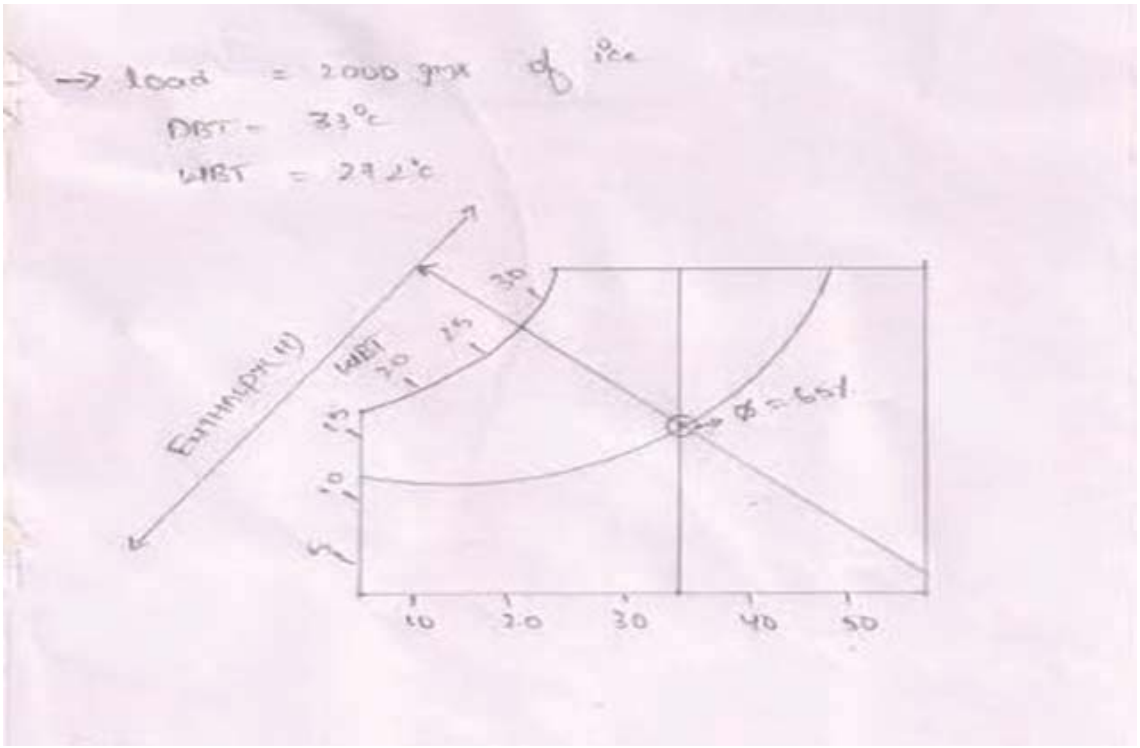
hfgdp = 2442.8 kj/kg

Therefore,

$h=1.022(27.2) + 0.02084[2442.8+2.3(25)]$

h=79.89 kj/kg of dry air

VI. GRAPHS FOR 2000GMS LOAD



Psychometric chart observation for 2000 load

VII. RESULTS & CONCLUSION

Our project Home Made Air Conditioning Unit is very useful for poor people which is of very cheap cost and easily carried from one room to other.

To make this project more reliable we checked this model for all these rooms ranging from 6 by 6, 10 by 10, 14 by 7 (feet) and thus found that this is more effective on 6 by 6 room. As the room size increases, temperature will be more inside the room. For that sake we have to provide 2 to 3 air conditioning units for more cooling effect for 14 by 7 size room and more Area of rooms.

The main advantage of the model is it can be movable to any place of a closed room. Thus the main benefit of this model is its flexibility. All you need to do is to carry the unit to that area where you want to chilled whether you are working in office or relaxing at home.

Various observations and results obtained from the project work tell that, suggested new designs more beneficial and it is good advancement in the conventional design.

REFERENCES

[1] James R. Lenz, Edward A. Cooksey, 2002 "Application of Fluid Dynamics to Compressor Efficiency Improvement" International Compressor Engineering Conference at Purdue ; 441,446

[2] Munjal M. C. , Acoustics of Ducts and Muffler: Wiley , New York 1987

[3] John .D. Anderson , Jr 2003 ,"Computational Fluid Dynamics" Mc Graw Hill International Edition New York ,1995 .

[4] International Standards ISO 3745 "Determination of Sound Power Level of Noise Source''– Precision method for Anechoic and Semi Anechoic room.